PROPOSED NEW CLAIMS

Sub B1

32. A method of controlling a laser module in a wavelength division multiplexing application, the module including temperature control means for controlling a temperature of a laser and a variable attenuation attenuator connected to an output of the laser for controlling power of radiation output from the module, the method comprising the steps of, in the order given:

A1

(a) establishing a predetermined laser temperature using the temperature control means;

(b) controlling a laser current to give a wavelength of operation substantially equal to a desired wavelength; and

(c) establishing a predetermined output power from the laser module by means of the attenuator.

33. The method according to claim 32, including, prior to performing step (b), the step of setting an attenuation of the attenuator to a maximum attenuation, and wherein step (c) comprises the step of reducing the attenuation to a level to give the predetermined output power of the laser module.

34. The method according to claim 33, wherein the step of setting the attenuator to the maximum attenuation occurs during step (a).

Sub B2

35. The method according to claim 33, wherein the attenuation is reduced gradually.

36. The method according to claim 35, wherein reduction of the attenuation starts while the wavelength of operation is still converging towards its final value.

37. The method according to claim 35, wherein the attenuation is increased gradually during shutdown of the laser.

Sub B3

38. The method according to claim 35, wherein the attenuation is changed in ramp fashion.

A1 cont'd

39. The method according to claim 32, wherein steps (a), (b) and (c) are performed using respective control loops.

40. The method according to claim 39, wherein the control loops have different time responses.

41. The method according to claim 40, wherein a power-setting loop of the control loops has the fastest response, and wherein a temperature-setting loop of the control loops has the slowest response.

42. The method according to claim 39, wherein the control loops are digital control loops.

43. The method according to claim 32, wherein step (b) includes the steps of setting the laser current to a value which produces a nominal desired wavelength, and adjusting the laser current via a control loop to achieve substantially the actual desired wavelength.

SubB47

44. The method according to claim 43, wherein step (b) utilizes two wavelength-monitoring means having maximum sensitivity at wavelengths respectively slightly greater than and less than a nominal wavelength of operation.

45. The method according to claim 44, wherein the wavelength of operation corresponds to a wavelength which gives rise to equal output signals from the two wavelength-monitoring means.

46. The method according to claim 32, wherein step (a) is performed only once when the laser module is initially powered up, the laser temperature being maintained constant while the laser module is in service.

A1 cont'D.

47. A method of controlling a laser module in a wavelength division multiplexing application, the module including a variable attenuation attenuator connected to an output of a laser for controlling power of radiation output from the module, the method comprising the step of: setting an attenuation of the attenuator to a maximum attenuation prior to powering-up or powering-down the laser.

48. The method as claimed in claim 47, wherein, during powering-up of the laser, following the setting of the attenuation to the maximum attenuation, a laser current is increased to a desired operating level and, when an operating wavelength of the laser has settled to a desired wavelength, or has come to within a given tolerance of the desired wavelength, the attenuation is reduced to a normal working level.

49. The method according to claim 48, wherein the attenuation is gradually reduced after the wavelength has settled to a final value.

50. The method according to claim 47, wherein, during powering-down of the laser, following the setting of the attenuation to the maximum attenuation, a laser current is reduced to a substantially zero level.

51. The method according to claim 32, wherein the laser module is used in a dense wavelength division multiplexing application.

52. The method according to claim 47, wherein the laser module is used in a dense wavelength division multiplexing application.

53. An apparatus for controlling a laser in a wavelength division multiplexing application, comprising: a temperature-control loop for controlling a temperature of the laser, a wavelength-control loop for controlling an operating wavelength of the laser, a power-control loop including a variable attenuation attenuator connected to an output of the laser for controlling an output power of the laser, and a control means for coordinating said control loops and operable for firstly establishing a desired laser temperature, for secondly establishing a desired wavelength through control of a current of the laser, and thirdly for establishing a desired laser output power by means of the attenuator.

54. The apparatus as claimed in claim 53, wherein the control loops have different time responses, the temperature-control loop having the slowest response and the power-control loop having the fastest response.

55. The apparatus as claimed in claim 53, wherein the wavelength-control loop comprises a pair of wavelength monitors having maximum sensitivities respectively slightly greater than and less than a desired operating wavelength.

56. The apparatus as claimed in claim 55, wherein the wavelength monitors are photodiodes.

A1 cont'D

57. The apparatus as claimed in claim 53, wherein the temperature-control loop comprises a temperature sensor for monitoring the laser temperature, the temperature sensor forming part of a Wheatstone bridge, the bridge being operative to provide a temperature-error signal to operate the temperature-control loop.

58. The apparatus as claimed in claim 53, wherein the control means is configured for ensuring that, prior to powering-up or powering-down the laser, the output power of the laser is reduced to a low level.

59. The apparatus as claimed in claim 53, wherein the laser is used in a dense wavelength division multiplexing application.